

# INTRODUCTION TO PHYSICS 107

## INTRODUCTORY APPLIED PHYSICS LAB: MECHANICS AND THERMODYNAMICS

### *What do we do in Physics 107?*

Physics 107 is a lab designed to support the Physics 105 lecture. Hopefully, the experiments presented here will develop a greater conceptual understanding of mechanics and thermodynamics. In addition it will give you a more physical experience with the material, skills in measuring and analyzing physical data, and experience with measurement equipment.

### *Adding and Dropping*

Adding and dropping (including sections changes) are done by computer through the entire add and drop period. Please be aware of the fees associated with such changes. Also, please make any changes that you need as early as possible so that other students can get into the class.

### *Preparing for the lab*

**Read each lab before coming to class.** Review the physics involved and get a general idea of what you will do. In the manual you will find an answer sheet for each lab. On that sheet there is a space to write an *overview* paragraph about the lab. **Your lab instructor will check this overview before you begin the lab.** Because you can't see the equipment before coming to lab you won't understand the details of how some equipment works. The purpose of the overview is to ensure that you are properly prepared to make optimal use of your time in the laboratory – performing the experiment. In the overview paragraph we are looking for a good conceptual understanding of what physical principles the lab is supposed to illustrate and how the activities in the lab do that. We are not looking for a restatement of what is going to be done.

### *At the beginning of each lab*

Your instructor will show you the equipment and explain how it works. He or she will not discuss the physical principles or laws much; you will already have reviewed them before coming to the lab. You should be organized into groups of *at most* three lab partners. It is better to have two groups of two than one group of four. You will work together in taking data and discussing it, but you will each write your own results and analysis. Make sure the instructor sees and initials your overview paragraph at the *beginning* of the class period.

### *Use of lab time*

We don't want you to feel hurried in the lab. It's hard to think creatively or carefully, or to enjoy learning if you're feeling pressured for time. In addition, experiments seldom go as planned; technical difficulties arise. *Attention will be paid to the quality of the work you do perform, and how earnest your effort is.* If you do not complete your lab, but you have been making an honest effort (your TA will know!) it will not affect your grade on the Measurements and Analysis portion (part C, see page iii). If you do not complete the lab and you have been goofing off, it *will* affect your grade. There is always plenty to do in the lab, so we expect you to arrive on time and to use your time well. You *will* be graded on how well you think about and describe what you see and learn. If you come late, leave early, or simply waste time, it will hurt your grade.

This is a one credit-hour class. A one credit-hour class at BYU is interpreted as 3 to 4 hours of work per week.

### *Getting help in the lab*

Your instructor will help you to understand and use the equipment. Your instructor will help you solve problems you have in taking data, graphing it on the computer, and curve fitting. Ask for help if you have difficulty doing the experiment.

However, when you don't understand your results and the physics (and that may be most of the time), **talk to your lab partners.** Take your time to talk it over and try to figure it out. You might consult

your text. If your lab group can't make sense of it, ask other class members. We've asked your instructor *not* to answer your questions about the physics too quickly during the lab.

### Lab reports

Lab reports are due at the end of the lab period and you are to give them to your instructor before leaving. You will have time in class to complete the answer sheet associated with each lab. You can often write most of the report as you do the experiments. We have found that students over-invest their time in the class if the reports go home with them (again, this is a one credit-hour course). Instead we wish you to write while the experience is fresh.

The reports are informal and hand written. If you concentrate on the quality of what you write, you shouldn't have to write too much. *Remember the purpose of everything you write is to **communicate** either what you know or what you have learned.* Keep your reports concise and focused. Avoid redundancy; we are fully aware of the procedure so **do not repeat to us the steps of the experiment** – this will detract from your grade. Write your measurements, observations, results, and discussion in your own words. Be sure to include the units on any numbers that have units. Include tables, graphs, and computer printouts, but be very careful that you **label, identify, and explain** what you see in them. *Be sure to include on graphs what each axis represents and their units*, as well as what the graph is telling you. Communicate clearly your interpretation of the graph.

Make sure you write your name, date, the lab, and your section number on the report.

### Making up missed labs

If you miss one lab, and don't make it up, your grade will drop by *one* level (*e.g.* from A- to B+) from what your grade would otherwise be based on the labs you completed. If you miss a total of two, three, or four labs, your grade will drop by *three, five, or seven* grade levels, respectively. If you miss more than that, you will have to repeat the course.

If you must miss a lab, you can attend another section doing the *same* lab (once the equipment is taken down it's *too late*). Contact your TA *first* for permission. If you can't reach your TA, call or email Bryan Peterson (422-7417, N355 ESC, bryan.peterson@byu.edu). Turn in your report to the TA in the section in which you are doing the makeup. It will be returned to your normal section after grading.

You may attend labs in other sections only with permission and for *valid*, infrequent reasons such as work emergencies, being out of town for a performance or interview, family emergencies, illness, etc. **It is never acceptable to go to another section so you can study, do homework, or take a test (even for physics).** Plan ahead. If you attend another section without prior arrangements your score on that lab will be reduced by 25%.

We will have makeup labs twice during the semester (see the schedule for when those will occur). We will have sign-ups for these makeup labs a couple of lab sessions in advance so that we can have the appropriate equipment ready. These make up periods are really intended for emergency use only. You are *not* allowed to attend a makeup for a lab you have already completed. *You will only be allowed to make up one lab in each session unless you have explicit permission from the supervising professor (not your TA).* You are also only allowed to make up the labs specified for that session unless you have explicit permission from the supervising professor (not your TA).

### Grading of labs

Your TA will visit you and initial your overview paragraph (near the bottom of what you have written) at the beginning of the lab. Your TA will also grade your participation during the lab period. Separate graders will grade other parts after the period. You will turn in your lab report at the end of your lab period and it will be graded between lab periods. Your grade on the lab will consist of the following 4 parts:

#### A. Preparation:

3 Points.

Your understanding of the relevant physics before coming to lab. The overview paragraph done well. Main concepts of the lab, and how the lab will illustrate those concepts, described in the overview paragraph.

Careful reading of manual before asking questions about procedure. Remember that your overview paragraph has to convince the grader that you have read the manual before coming to lab.

*B. Participation:*

3 Points.

Punctual, followed grouping instructions, active in discussion, hands on the equipment, engaged with experiment, cleaned up work area before leaving.

*C. Measurements and analysis:*

3 Points.

Careful data taking and recording, correct analysis and calculations. Units on values indicated. Printed graphs attached when appropriate. All graphs and tables correctly labeled.

*D. Results/Discussion/Conclusions:*

3 Points.

Insightful comments on results, discussion of how well the measurements show physical principles. Possible sources of error in your results. Relationship between what was done in the lab and other physical systems outside the lab. Comments on what you learned in the lab. This is not intended to just be a review of the lab. Your goal should be to convince the grader that you have thought about the concepts and results from the lab. If you ran out of time and did not complete the lab you should indicate the reason that you were unable to complete everything.

A score of 3 means that you have done everything expected of that lab, with maybe some minor problems. A score of 2 means that you were deficient in some meaningful way. A score of 1 means that the section is seriously incomplete or just wrong. A score of 0 means that the section was not seriously attempted.

Your scores can be viewed on the Internet through Blackboard. To view your grades, select Physics 107 and in the Course Materials go to the 'online grades' link. Enter the requested information on that page. It will ask you for your class ID. The page also asks for the last 4 digits of your BYU ID. There is also a link from the Physics 107 web page (Physics & Astronomy home page [[www.physics.byu.edu](http://www.physics.byu.edu)] ⇒ Courses ⇒ Class Web Pages ⇒ [Scroll to the current semester or term, it's usually at the top] ⇒ Physics 107).

You should receive your lab report back at the beginning of the next class period. If you receive a 2 or lower on any part of the lab, the reason should be indicated on the report.

*Papers during the semester*

The highest grade you can earn by just doing the labs is an A-. In order to earn an A in the class you will need to turn in two papers during the course of the semester. Each paper should be 2 pages, double-spaced with no larger than a 12-point font. The first will be due the week of lab 6. The last paper will be due at the time of the last lab period (lab 12). The topic of each paper should be an *application* to a real physical system of the principles of physics demonstrated in one of the labs completed during the preceding weeks, including the week when it is due. It is not acceptable to just rewrite one of your lab reports - your paper must be an extension of the concepts in that lab to a real application. In general you should limit your paper to the principles from only one lab. The first paper would be on one of the topics in labs 1-6; the second would be on one of the labs 7-12. If you don't earn an A- in the class (due to missed labs or poor labs) then the two papers will boost your grade by 1 grade level. If you only do one paper it will boost your grade by 1/2 grade level (*i.e.*, if you have a low B+ it will stay B+ but if you have a high B+ it will be raised to an A-). The papers will be expected to be well written, properly spelled, grammatically correct, and coherent in their ideas. Your TA will grade them as either acceptable or unacceptable. If a paper is unacceptable (because of the writing or wrong physics) you can rework it and turn in both the original paper (complete with TA comments and grade) and the rewritten paper to Dr. Peterson and he will grade it.

*Your final grade*

If you turn in all the labs and get 3's on all sections you will get an A-. If, in addition, you turn in both papers you will get an A. If you get 4 or more 2's, then your grade will be lowered by the appropriate amount. Since a score of 2 represents a meaningful deficiency, four or more 2's represents a meaningful deficiency in 33% or more of the labs that you did or multiple deficiencies in several labs. Your final grade is **not** based on any of the commonly used percentage scales.

### *Evaluation of the class*

We support the idea of regular evaluation of instruction at the university. We encourage you to fill out the class evaluation on Route-Y during the evaluation period at the end of the semester. Since this is a laboratory class that is actually taught by a TA rather than the supervising professor, the target of the instructor evaluation may be somewhat uncertain although it is generally assumed that you will be evaluating the performance of the TA who was the actual instructor of your section.

### *Academic Honesty*

The first injunction of the BYU Honor Code is the call to be honest. Students come to the university not only to improve their minds, gain knowledge, and develop skills that will assist them in their life's work, but also to build character. President David O. McKay taught that "character is the highest aim of education" (*The Aims of a BYU Education*, p. 6). It is the purpose of the BYU Academic Honesty Policy to assist in fulfilling that aim. BYU students should seek to be totally honest in their dealings with others. They should complete their own work and be evaluated based upon that work. They should avoid academic dishonesty and misconduct in all its forms, including but not limited to plagiarism, fabrication or falsification, cheating, and other academic misconduct.

### *Honor Code Standards*

In keeping with the principles of the BYU Honor Code, students are expected to be honest in all their academic work. Academic honesty means, most fundamentally, that any work you present as your own must in fact be your own work and not that of another. Violations of this principle may result in a failing grade in the course and additional disciplinary action by the university.

Students are also expected to adhere to the Dress and Grooming Standards. Adherence demonstrates respect for yourself and others and ensures an effective learning and working environment. It is the university's expectation, and my own expectation in class, that each student will abide by all Honor Code standards. Please call the Honor Code Office at 422-2847 if you have any questions about those standards.

### *Preventing Sexual Discrimination or Harassment*

Title IX of the Education Amendments of 1972 prohibits sex discrimination against any participant in an educational program or activity that receives federal funds. The act is intended to eliminate sex discrimination in education. Title IX covers discrimination in programs, admissions, and student-to-student sexual harassment. BYU's policy against sexual harassment extends not only to employees of the university but to students as well. If you encounter sexual harassment or gender-based discrimination, please talk to your professor; contact the Equal Opportunity Office at 422-5895 or 367-5689 (24-hours), D285 ASB; or contact the Honor Code Office at 422-2847, 4440 WSC.

### *Students with Disabilities*

BYU is committed to providing a working and learning atmosphere that reasonably accommodates qualified persons with disabilities. If you have any disability that may impair your ability to complete this course successfully, please contact the Services for Students with Disabilities Office (1520 WSC, 422-2767). Reasonable academic accommodations are reviewed for all students who have qualified, documented disabilities. Services are coordinated with the student and instructor by the SSD Office. If you need assistance or if you feel you have been unlawfully discriminated against on the basis of disability, you may seek resolution through established grievance policy and procedures by contacting the Equal Employment Office at 422-5895, D285 ASB.

### *Children in the Classroom*

The serious study of the physical and mathematical sciences requires uninterrupted concentration and focus in the classroom. Having small children in class is often a distraction that degrades the educational experience for the entire class. Please make other arrangements for child care rather than bringing children to class with you. If there are extenuating circumstances, please talk with your instructor in advance.